

**SEMI-PHYSICAL MODELING OF HEMT HIGH FREQUENCY SMALL-  
SIGNAL EQUIVALENT CIRCUIT MODELS**

**ABSTRACT OF THE DISCLOSURE**

A semi-physical device model for HEMTs that can represent known physical device characteristics and measured high frequency small signal characteristics relatively accurately. The semi-physical device model in accordance with the present invention uses analytical expressions to model the fundamental electric charge and field structure of a HEMT internal structure. These expressions are based on the device physics but are in empirical form. In this way, the model is able to maintain physical dependency with good fidelity while retaining accurate measured-to-modeled DC and small signal characteristics. The model in accordance with the present invention provides model elements for a standard small signal equivalent circuit model of FET. The model elements are derived from small signal excitation analysis of intrinsic charge and electric field as modeled within the device by the semi-physical HEMT model. As such, the RF performance can be predicted at arbitrary bias points.

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